



Verification Report for

Terra Yazoo City #9,
Nitrous Oxide Abatement Project
Yazoo City, MS, USA

Third Reporting Period
Climate Action Reserve Project CAR768

Nitric Acid Production
Project Protocol, Version 1.0
December 12, 2012

Report Prepared for

Terra Mississippi Nitrogen, Inc.,
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USA

Report Prepared by

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Summary

Terra Mississippi Nitrogen, Inc. (“TMNI”) is the project developer for the “Terra Yazoo City #9, Nitrous Oxide Abatement Project” located at Yazoo City, MS. In this third reporting period, TMNI reported on its nitrous oxide reduction results during two nitric acid production campaigns that commenced on March 2, 2011, and ended on December 13, 2011. NSF International Strategic Registrations (NSF-ISR) was engaged to verify the nitrous oxide emissions reductions achieved during these campaigns in accordance with the requirements of the Climate Action Reserve Nitric Acid Production Project Protocol, Version 1.0. TMNI reduced emissions into the atmosphere by 221,182 metric tons of carbon dioxide-equivalent in this reporting period. TMNI’s nitric acid production operations were described by the NAICS code 325311 (“nitrogenous fertilizer manufacturing”).

1. Introduction

1.1 Objective

The objective of this verification audit was to determine, with reasonable assurance, that TMNI had quantified, monitored, and fairly reported to the Climate Action Reserve its emission reductions from the abatement of nitrous oxide emissions during nitric acid production and to confirm the project’s eligibility.

1.2 Scope

The scope of the engagement included verification of the quantification, monitoring and reporting of greenhouse gas emission reductions from the project. It also included verification of the project’s eligibility and the calculation of project emissions of nitrous oxide measured in the nitric acid plant stack.

1.3 Criteria

NSF-ISR verified the reported project emission reductions against criteria in the Climate Action Reserve Nitric Acid Production Project Protocol, Version 1.0 (December 2, 2009), including the Errata and Clarifications issued by the Climate Action Reserve on March 17, 2011 (hereafter, the “Protocol”). The project also was verified against applicable requirements of the Climate Action Reserve’s Program Manual (October 26, 2011). The verification methodology conformed to requirements in the Climate Action Reserve’s Verification Program Manual (December 20, 2010), and ISO 14064:2006 Part 3, *Greenhouse gases – Specification with guidance for the validation and verification of greenhouse gas assertions*.

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1.4 Materiality

In accordance with the Climate Action Reserve Verification Program Manual, the threshold for materiality of emission reduction assertions was based upon annualized rates of issuance of Climate Reserve Tonnes (CRTs). As the project claimed more than 100,000 metric tons of emission reductions during the reporting period, the emission reduction assertion was considered fairly stated if it varied by no more than 1% from a complete statement of the project's emission reductions. Thresholds of materiality defined by the Verification Program Manual allowed verifiers of emission reduction reports to consider as immaterial discrepancies of 1% or less.

1.5 Level of Assurance

This engagement was performed at the reasonable level of assurance.

2. Verification Approach

2.1 Team Appointment and COI Review

This verification was performed by John Shideler, Lead Verifier. The verification was internally reviewed by Janette Lutz, Lead Verifier. Conflict of Interest inquiries were completed for NSF-ISR and for the verification team and a finding of low COI risk was confirmed by the Climate Action Reserve.

2.2 Document Review

The verification team conducted a document review to inform the planning process in advance of performing verification activities. Documents and records reviewed were provided by TMNI, the project developer; and by Climeco, the project developer's consultant. Documents reviewed included previous project verification reports; project documentation submitted to the Climate Action Reserve; project Monitoring Plan; spreadsheets providing logged hourly raw operating data and calculations of emission reductions; CEMS, gas flow meter, and N₂O analyzer calibration and verification records; regulatory compliance information from the US EPA Enforcement & Compliance History Online (ECHO) report and company records; and manufacturer's information related to monitoring equipment.

2.3 Planning

NSF-ISR's verification approach is risk-based. It draws upon our understanding of risks to fair statement of reported emissions and the operation of controls to reduce such risks. As a result of the document review and correspondence with Climeco personnel, a verification plan and a sampling plan were developed for this engagement.

2.4 Verification Activities

For this third reporting period of the project, NSF-ISR conducted a site visit to TMNI's nitric acid plant #9 in Yazoo City, MS, on August 7-8, 2012. The site visit to TMNI's facility was

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performed to verify continuing eligibility of the project and to sample and test aspects of the project's emission reduction assertion. Subsequent verification activities were conducted offsite and via exchange of correspondence. This report is based upon the visual confirmation of installed secondary catalyst in the ammonia oxidation reactor (AOR) and monitoring devices, examination of documented evidence, and confirming interviews with persons having responsibility for various aspects of the project. Verification activities included:

- Confirmation of the project start date and plant location.
- Verification of the ownership of the emission reduction credits earned by this project.
- Verification that the project monitors legal and regulatory changes and that the project continues to meet the legal requirement test for continuing eligibility under applicable laws and regulations.
- Verification that the project campaigns were operated in material compliance with applicable environmental and safety laws.
- Demonstration by the project developer that none of the exclusions to eligibility applied to the nitric acid production campaigns conducted during this reporting period.
- Review of project compliance with monitoring requirements and that any identified variances have been approved by the Climate Action Reserve.
- Verification that applicable sources, sinks and reservoirs were included in the project assessment boundary.
- Verification that the project developer correctly calculated permitted operating ranges for temperature and pressure in accordance with protocol requirements.
- The control environment, information management systems and monitoring plans of TMNI.
- The records management system implemented at TMNI for acquisition and retention of all Protocol required information.
- Verification of the project emission reduction calculations.

3. Verification Findings

3.1 Project Description

This verification report covers the third reporting period of TMNI's "Terra Yazoo City #9, Nitrous Oxide Abatement Project." In this reporting period TMNI abated 221,182 metric tons of carbon dioxide-equivalent greenhouse gas that would have been emitted into the atmosphere absent the application of secondary catalytic reduction technology.

3.2 Eligibility

Location. TMNI planned its nitric acid production project to abate N₂O emissions at its Plant #9 in Yazoo City, MS. This facility meets the protocol requirement for location in the United States.

Project Definition. TMNI installed a secondary abatement catalyst in Plant #9 and operated two production campaigns during 2011 that spanned a period of time that did not exceed 12 months.

Project Start Date. The start date of the project, defined by the Protocol as the date on which production commences after the first installation of a secondary catalyst, was April 16, 2009. This start date was verified by reviewing the verification report submitted to the Climate Action Reserve for the initial reporting period of the project. The project met eligibility requirements because it was submitted for listing on June 4, 2010, a date within 12 months after the adoption on December 2, 2009, of the Nitric Acid Production Protocol; and the project start date was no more than 24 months prior to the adoption of the Nitric Acid Production Protocol.

Crediting Period. The crediting period for TMNI's nitric acid abatement project extends to 15 April 2019. This third reporting period is within the crediting period for the project.

3.3 Additionality

Legal Requirement Test. NSF-ISR interviewed the corporate EHS manager for CF Industries (parent company of the project developer) concerning his frequent monitoring of legal and regulatory developments with fertilizer trade association officials. NSF-ISR also reviewed the Attestation of Voluntary Implementation submitted by TMNI for this reporting period. NSF-ISR has concluded on the basis of this evidence that there are no legal requirements that mandate the abatement of N₂O at the project site, that the project met the Protocol's monitoring requirement for voluntary implementation, and that the project continues to pass the legal requirement test.

Performance Standard Test. NSF-ISR has concluded that TMNI met the Performance Standard Test because it installed a secondary N₂O abatement catalyst in the ammonia oxidation reactor of its nitric acid plant #9 in Yazoo, City, MS. The Yazoo City plant #9 has not been restarted after having been out of operation for a period of 24 months or longer. Plant #9 was not a newly constructed plant after the effective date of the protocol, and it did not have non-selective catalytic reduction technology installed at any point within 24 months prior to the effective date

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of the protocol. The N₂O abatement technology is installed at a single nitric acid plant at the Yazoo City facility.

Regulatory Compliance. NSF-ISR reviewed the Attestation of Regulatory Compliance completed by TMNI for the third reporting period dated August 21, 2012. The period for material compliance with laws and regulations was from March 2, 2011, the date the sixth nitric acid production campaign began, to December 13, 2011, the date the seventh nitric acid production campaign ended. NSF-ISR reviewed the U.S. EPA ECHO report with Yazoo City plant officials, and reviewed correspondence with state regulatory bodies. NSF-ISR concluded that no regulatory compliance issue was associated with nitric acid plant #9. NSF-ISR also reviewed safety information and concluded that the project was in material compliance with applicable environmental and safety requirements during the two production campaigns.

3.4 Ownership

Project Developer and Ownership. Terra Mississippi Nitrogen, Inc. (TMNI), the project developer, is the owner of the emission reduction credits. For this reporting period TMNI attested to its ownership of the greenhouse gas emission reduction credits through a signed Attestation of Title dated August 21, 2012, which NSF-ISR reviewed. NSF-ISR interviewed CF Industries personnel who confirmed the wholly owned subsidiary relationship of TMNI to CF Industries, the owner of the Yazoo City plant that includes nitric acid plant #9. The signatory to the attestation of title was an officer of TMNI and the General Manager of CF Industries' Yazoo City plant. From this evidence NSF-ISR has concluded that TMNI was the legal owner of the greenhouse gas emission reduction credits during this reporting period.

3.5 Project Boundaries and Emission Sources

Sources, Sinks and Reservoirs. NSF-ISR has verified that for this project reporting period, the relevant sources, sinks and reservoirs (SSRs) were identified. Sources included the nitric acid plant #9's AOR from the inlet of the ammonia burner to the waste gas stack, which NSF-ISR inspected. Nitrous oxide (N₂O) is a by-product of nitric acid production. Secondary catalytic abatement reduces N₂O immediately after it is formed in the ammonia oxidation step of nitric acid production. The project measures the amount of N₂O released to the environment through the AOR stack and subtracts that from the baseline condition of uncontrolled N₂O emissions.

3.6 Project Management System

Management System. NSF-ISR reviewed relevant aspects of the Yazoo City plant's management system during its on-site visit on August 7-8, 2012. NSF-ISR found a mature management system and competent personnel. Safety training was required for access inside the plant and procedures were in place for plant operation and environmental management. NSF-ISR included the following management systems elements in its evaluation:

- Definition and maintenance of an appropriate control environment by TMNI
- Training and competence of project managers and operating/data management personnel
- Identification and management of legal requirements related to nitric acid production
- Identification and maintenance of records required by the project

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- Selection, installation, maintenance, calibration and monitoring of Continuous Emissions Monitoring, stack gas analyzer, and flow metering equipment
- Quantification methods and calculations of project emissions; and
- Checking and corrective action mechanisms.

From this evidence, NSF-ISR has concluded that TMNI's management system met the requirements described in the Climate Action Reserve's Verification Program Manual.

Project Documentation and Reserve Tracking System. NSF-ISR verified that the required documents for the project had been completed and submitted to the Reserve. These included the Project Submittal form, uploaded at the beginning of the project; signed attestations of title, of regulatory compliance, and voluntary implementation for this reporting period; a project diagram, and an assertion of Climate Reserve Tonnes earned during campaigns 6 and 7.

3.7 Performance against Project Protocol/Methodology

The project was implemented in conformity with the Climate Action Reserve Nitric Acid Production Project Protocol Version 1.0.

Monitoring and Operations Plan. TMNI had established a "Monitoring Plan for Nitrous Oxide Abatement Project Yazoo City AOP #9," which NSF-ISR reviewed. The plan addressed monitoring, operations and reporting of relevant parameters included in Table 6.1 of the Protocol, including the frequency of data acquisition, the frequency of instrument field check and calibration activities, and the roles of individuals performing each specific monitoring activity. It also defined record keeping requirements and described the procedure TMNI used to determine that the project at all times met the Legal Requirement Test.

Baseline Scenario. In accordance with the Protocol, the baseline emission rate had been established by measuring N₂O emissions during a complete production campaign prior to the installation of the secondary catalyst for the abatement project. The baseline emission factor developed during this pre-project monitoring was verified during TMNI's first reporting period. NSF-ISR reviewed the baseline emission factor to ensure that it was consistent with the emissions factor verified in the first reporting period.

Use of CEMS. TMNI used a Continuous Emissions Monitoring System to directly measure N₂O concentration and flow rate in the stack gas of the AOR. An ABB Uras26 non-dispersive infrared sensor installed in the stack pipe analyzed gas concentration. A Mid-West Instrument Delta Tube Model 342 flow meter measured flow in conjunction with a differential pressure transmitter. Concentration and flow data were monitored continuously but logged in hourly increments along with stack temperature and pressure and the air to ammonia ratio and ammonia flow. NSF-ISR reviewed quarterly calibration records for the flow meter transmitter which took place on March 1, June 27, and September 29, 2011; and on March 21 and June 20, 2012. The electrical output of the transmitter was measured at 0% of span (4 milliamps) and at 100% of span (20 milliamps). In all cases, as-found records showed little or no drift from previous calibrations and results remained well within prescribed calibration tolerances. To verify the continuing accuracy of the gas analyzer, TMNI performed cylinder gas audits in 2011 on March 30, June 2, 29 September,

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and a linearity check on March 8 in 2012. Leak tests were performed on the flow meter transmitter pressure line tubing in September 2011, March 2012, and June 2012 with satisfactory results. Relative Accuracy Test Audits were conducted in December 2010 and November 2011 by an independent third party per the guidelines in the Reserve protocol and 40 CFR Parts 60 and 75. Except for certain requirements that were the subject of a variance request submitted to the Climate Action Reserve (see paragraph 3.10, below), NSF-ISR concluded that TMNI's use of CEMS met all protocol and Part 60 and Part 75 requirements.

QA/QC and Frequency of Testing. Quality Assurance/Quality Control procedures were implemented in accordance with Clean Air Act requirements of the U.S. Environmental Protection Agency, specifically those included in the Acid Rain Program regulations published at 40 CFR Part 75, Appendix B, and 40 CFR Part 60, Appendix B. QA/QC procedures included daily, quarterly and annual assessments and scheduled preventive maintenance for the CEMS and its components. NSF-ISR reviewed records to determine that monitoring requirements in the Protocol (as updated by the Errata and Clarifications document published on March 17, 2011) were met. Evidence submitted to NSF-ISR demonstrated that N₂O concentration analyzer calibration error tests and calibration adjustments were performed daily along with data validation and data recording. The N₂O concentration analyzer was also subject to quarterly data validation and linearity checks. The flow meter was calibrated quarterly with leak checks. On an annual basis, Relative Accuracy Test Audits (RATA) were performed and bias adjustment factors applied when applicable. Because the variance was less than 7.5%, Yazoo City was eligible to have RATAs performed on an annual rather than semiannual basis. Grace period assessments did not apply. Flow-to-load ratio or gross heat rate evaluation was not performed because the nitric acid plant did not also produce electricity or steam.

Data Management. The project logged operational data on a continual basis and exported data on an hourly basis for monitoring purposes. Data logged included stack flow, temperature and pressure, N₂O concentration, and stack flow corrected to 0°C. Data were recorded in English measurement units for operating room monitoring and converted for reporting purposes to metric units. NSF-ISR reviewed the conversion algorithms and determined that data had been properly reported in metric units. Operational data were checked for values outside permitted operating conditions. NSF-ISR verified that the nitric acid plant had not operated outside these limits for more than 50% of the duration of the reporting period. During campaign 6 operations outside permitted ranges occurred less than 8% of the time, and less than 28% of the time during campaign 7.

Consistency With Past Reporting Periods. NSF-ISR compared the emission reductions claimed during the third reporting period to those claimed during the second reporting period, and found comparable rates of CRT generation per ton of nitric acid produced. The following table relates emission reductions in the two reporting periods to respective rates of nitric acid production:

Reporting Period	CRTs Credited	Nitric Acid Produced (mt)	Ratio CRTs/HNO ₃
2	218,069	146,567	1.49
3	221,182	160,700	1.38

From this evidence NSF-ISR concluded that the reported emission reductions were consistent with those achieved in the slightly shorter previous reporting period.

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3.8 Calculation of GHG Emission Reductions

NSF-ISR separately calculated project emission reductions from monitored information and confirmed that TMNI's claimed emission reductions did not vary by a material amount from those calculated by NSF-ISR. The verification team reviewed data downloaded from the CEMS and performed check calculations in the spreadsheet on values such as mean concentration of stack gas and the mean stack gas volume flow. The verification team checked the raw logged data to verify that the AOR did not exceed permitted operating conditions during more than 50% of the time during the reporting period, and verified that average operating values obtained during each campaign remained within historical ranges.

NSF-ISR confirmed that TMNI had performed the required statistical analysis steps specified in the Errata and Clarifications document (March 17, 2011) to compare the average values of permitted operating conditions (stack gas flow, N₂O concentration, temperature, pressure and maximum ammonia to air ratio) with the average values obtained during the baseline sampling period. NSF-ISR found that the results obtained for campaigns 6 and 7 were well within the permitted operating conditions. Equation 5.3 of the protocol recorded a mean baseline nitrous oxide concentration rate of 2,080 mgN₂O/m³ based on the results of the baseline sampling period. This compares to a mean N₂O concentration rate of 559.15 during campaign 6 and a mean N₂O concentration rate of 633.11 for campaign 7. The lower, actual values of nitric acid produced were used in Equation 5.1 in place of scaled maximum values.

NSF-ISR reviewed the inputs to Equation 5.4 which calculated project emissions as the product of stack gas flow volume multiplied by the N₂O concentration and the operating hours. The input numbers for this equation matched operating records provided by TMNI. An emissions factor for each campaign was calculated in accordance with Equation 5.5 as a ratio of product emissions to nitric acid produced.

3.9 Corrective Action Requests

NSF-ISR issued a number of clarification requests, findings of nonconformity and recommendations to project management during the verification process. All material issues were resolved. Details on the clarifications requested, the material and immaterial nonconformities issued, and the recommendations made are provided to the project developer and to the Reserve in a List of Findings, a private document.

3.10 Approved Variances or Deviations

TMNI applied to the Climate Action Reserve for several variances from Protocol requirements during the third project reporting period of this project. In 2011 TMNI had conducted cylinder gas audits instead of linearity checks on the CEMS during quarters when a RATA was not performed. TMNI had done this in accordance with CEMS testing requirements found in 40 CFR Part 60, instead of the required 40 CFR Part 75. The difference between the two testing methods was the use of two levels of calibration gas concentrations versus the three levels of calibration gas concentrations in the respective regulations. The variance applied to the first, second and third quarters of 2011. In accordance with the granted variance, NSF-ISR was able to determine that the three cylinder gas audits conducted during the first, second, and third quarters of 2011

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were appropriate for the actual concentration spans observed under normal project operating conditions and met all other requirements of the Protocol and 40 CFR Part 75.

With respect to RATAs performed in December 2010 and November 2011, NSF-ISR determined that relative accuracies found were between 5.01% and 5.09% as stated by TMNI, and that they were performed in accordance with requirements in the Protocol and 40 CFR Parts 60 and 75.

The Protocol required the performance of leak checks for differential pressure flow meters on a quarterly basis. A review of the manufacturer's documentation for Mid-West Instrument's Delta Tube flow meter found no reference to a leak check procedure. The project developer instead has followed e-mail guidance from the manufacturer to use a soapy solution to check for pressure tube leaks. This procedure is documented in TMNI's monitoring plan.

4. Verification Results

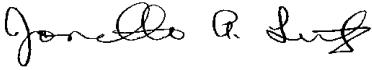
4.1 Verification Team Recommendation

Based on the verification activities described above, the verification team has concluded that the TMNI's CAR768 project, "Terra Yazoo City #9, Nitrous Oxide Abatement Project") third reporting period, has achieved the following emission reductions:

Reductions/Removals During This Reporting Period	Metric tons CO ₂ -e
Project baseline	221,497
- Project emissions	315
- Project adjustments (explain)	N/A
= Net project emission reductions/removals (rounded down)	221,182

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4.2 Verification Audit Summary

Project Developer	Terra Mississippi Nitrogen, Inc., 4608 Highway 49 East Yazoo City, MS 39194 (USA)
Project Location	Terra Mississippi Nitrogen, Inc., 4608 Highway 49 East, Plant #9 Yazoo City, MS 39194 (USA)
Project Type	Nitric Acid N ₂ O – Secondary Catalyst
Project Period	March 2 – December 13, 2011
Protocol/Methodology	Climate Action Reserve, Nitric Acid Production Project Protocol, v. 1, including Errata and Clarifications issued on March 17, 2011.
Emissions/Removals Verified	Vintage 2011: 221,182 metric tons CO ₂ -e
Verification Conclusion	Based upon the verification activities described above, NSF-ISR has concluded that Terra Mississippi Nitrogen, Inc.'s reported 2011 vintage emission reductions of 221,182 metric tons CO ₂ -e reported to the Climate Action Reserve for the period March 2 – December 13, 2011 are, in all material respects, fairly stated.
Lead Verifier	 John C. Shideler, December 12, 2012
Internal Reviewer	 Janette Lutz, December 12, 2012
<i>This verification statement is valid when signed and dated by an NSF-ISR internal reviewer.</i>	